Coral Reef Ecosystem Monitoring in Guam



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Tumon, Guam

Monitoring and Assessment Activities in Guam

- Guam Coral Reef Monitoring Group
- Coordinated Monitoring
- Monitoring for Management
  - Marine Preserve
  - Coastal EMAP
  - War in the Pacific National Historical Park
  - University of Guam Marine Laboratory

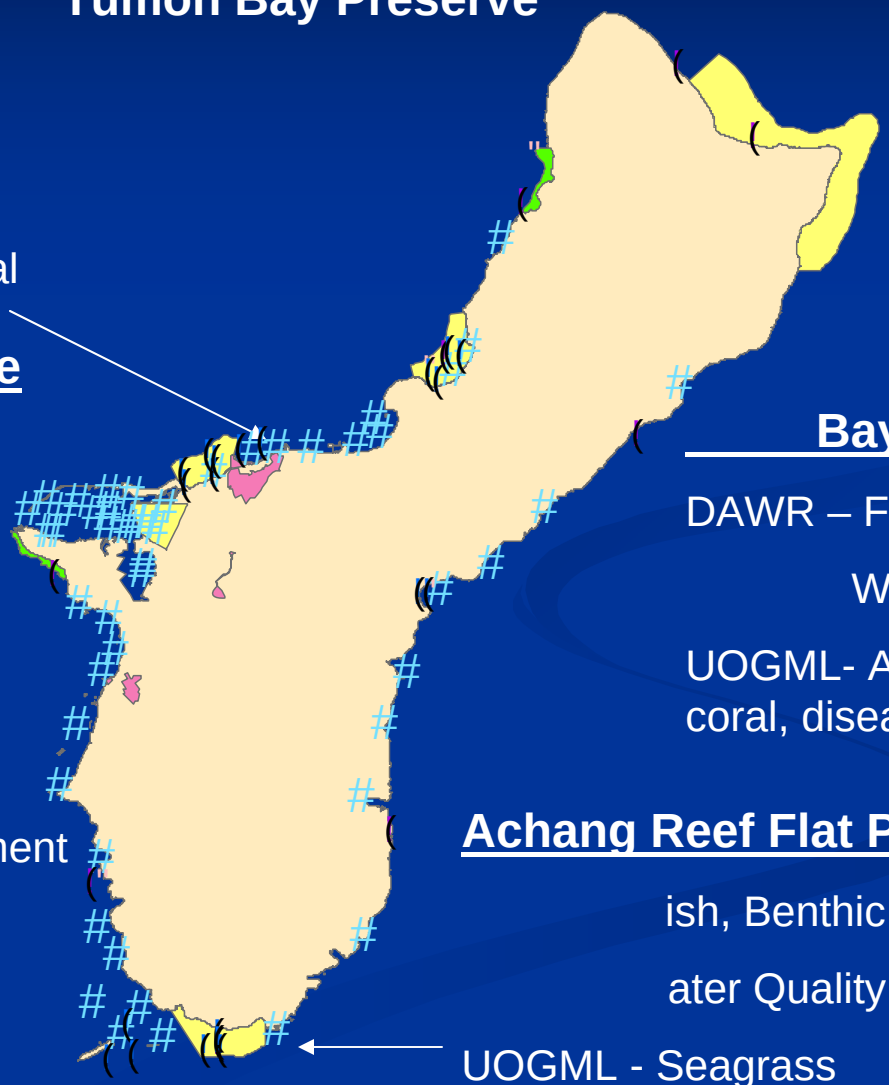
Guam Coral Reef Monitoring Group

- Division of Aquatic and Wildlife Resources
- Guam Environmental Protection Agency
- University of Guam Marine Laboratory
- Water and Environmental Research Institute
- National Park Service
- Guam Coastal Management Program

Monitoring For Management

- Monitoring provides data necessary to make informed management decisions
  - Marine Preserves Effectiveness (DAWR)
  - Coastal Environmental Monitoring and Assessment Program (GEPA)
  - Effects of Wildland Fires and Badland Mitigation on Nearshore Environments (NPS)
- Complemented by targeted research to address specific issues
  - University of Guam Marine Laboratory
  - Water and Environmental Research Institute

Coordinated Monitoring



Tumon Bay Preserve

War in the Pacific

DAWR – Fish, Benthic

NPS – Sedimentation, Coral

Piti Bomb Holes Preserve

DAWR – Fish, Benthic

GEPA – Water Quality

UOGML- Algal abundance, Seagrass, Nutrients

Fouha Bay

UOGML – Coral, algae, sediment

GEPA – EMAP

5 Permanent Sites

45 Random

Comprehensive Assessment

Bay

DAWR – Fish, Benthic

Water Quality

UOGML- Algal abundance, coral, diseases and bleaching

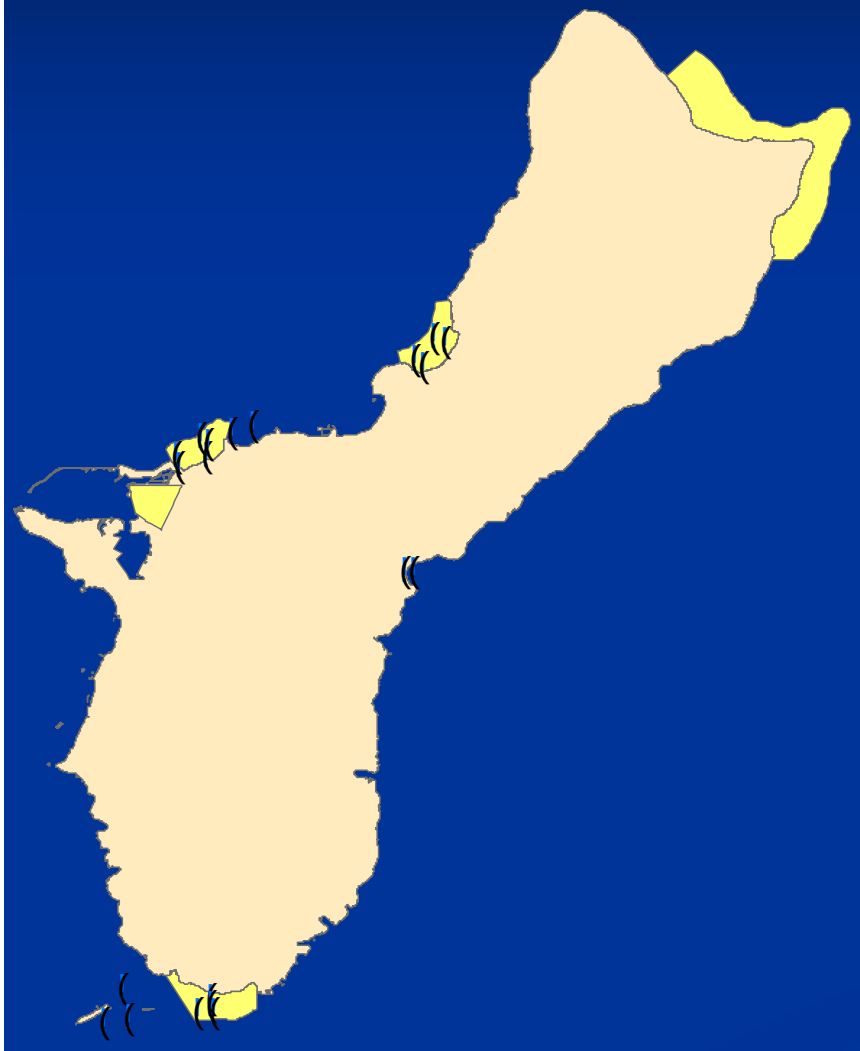
Achang Reef Flat Preserve

ish, Benthic

ater Quality

UOGML - Seagrass

Marine Preserves

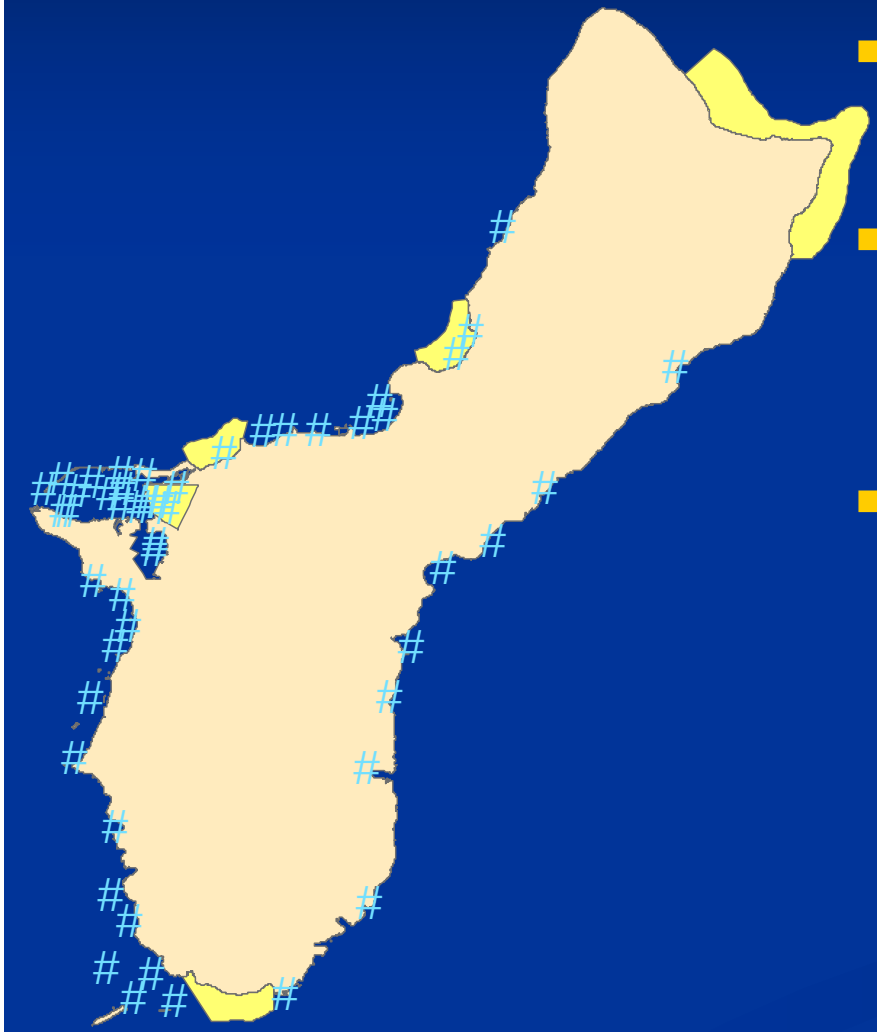


- Monitoring began prior to full enforcement in 2001
  - Achang Reef Flat Marine Preserve
  - Piti Bomb Holes Marine Preserve
- Designed to assess the effectiveness of the marine preserves
  - Monitoring to be expanded in 2005 to include Tumon Bay Marine Preserve and Water Quality Parameters

Marine Preserve

- Fish Surveys (DAWR)
  - Permanent Strip Transects, 50 x 5 m
  - Timed Swim Counts 30 minutes
    - Reef Flat - 8 transects
      - Seagrass Beds, Coral/Rubble, Channel
    - Fore Reef Slope – 4 transects at 2 sites
      - 20, 30, 40, & 50 foot contour
- Benthic Surveys (DAWR)
  - Video Transects
    - % cover
- Water Quality (GEPA)
  - Grab Samples
    - Bacteria, Conductivity, Nitrate-nitrogen, Chlorophyll-a, Pheophytin-a, Ammonium, Total Nitrogen, Ortho-Phosphate, Total Phosphorous, pH, Total Dissolved Solids, Total Suspended Solids, Dissolved Oxygen
  - In Situ Samples
    - Conductivity/Salinity, Depth, Dissolved Oxygen, pH, Temperature, Turbidity (NTU), and Transparency/Clarity

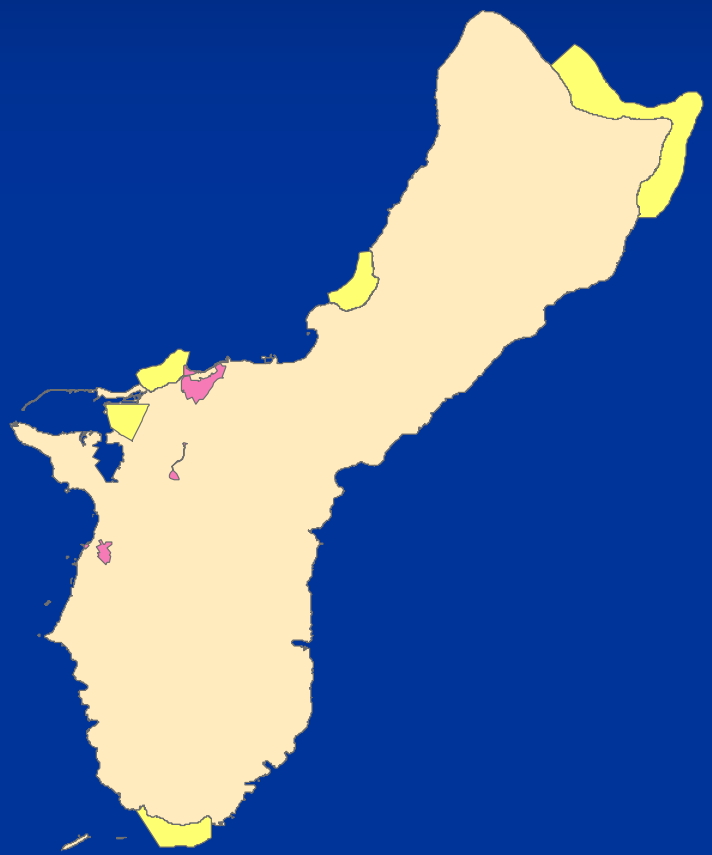
COASTAL EMAP



- Uses a probabilistic, stratified-random sampling design for Islandwide coverage
- Integrates data from multiple indicators
  - Biological
  - Water Column
  - Sediment Chemistry
- Goals:
  - To assess the physical, biological, and chemical condition of Guam's Marine waters
  - To rank relative importance of various stressors on the affected resource types

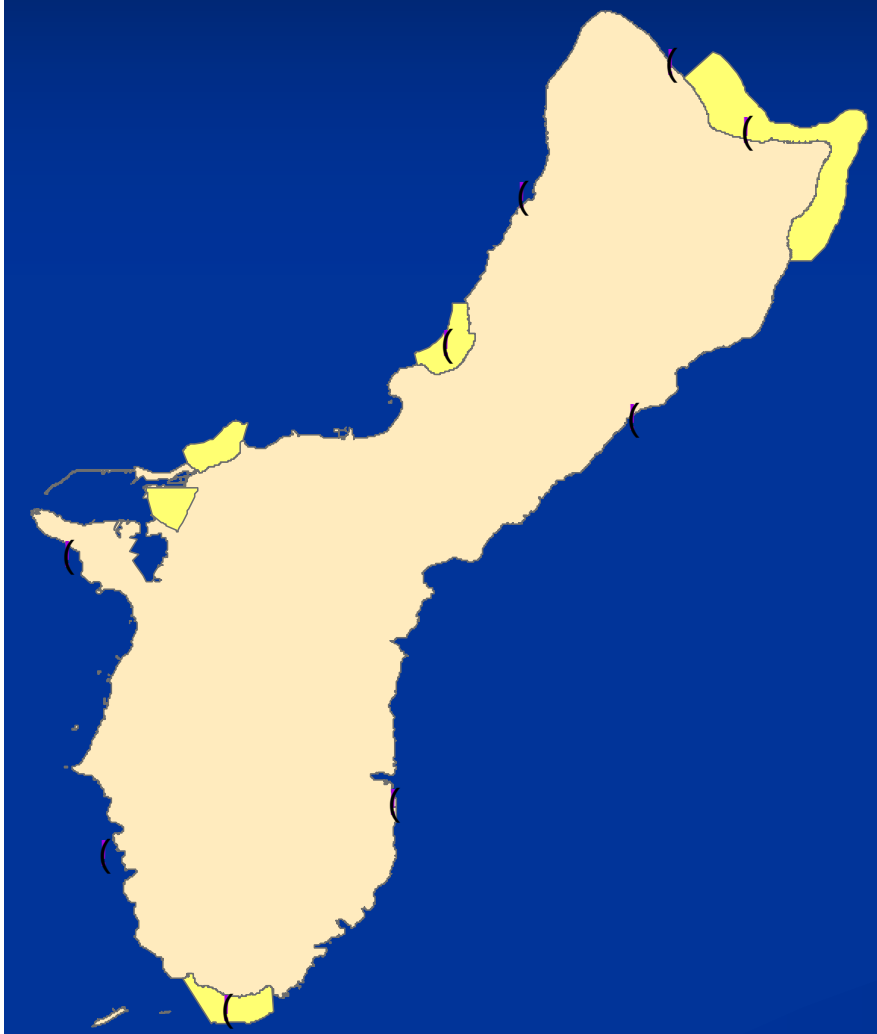
1. Physical/Chemical	
Water Column Characteristics	
1	Temperature
2a	Transparency/Clarity (Secchi Visibility)
2b	Transparency/Clarity (PAR)
3	pH
4	Salinity
5	Conductivity
6	Dissolved Oxygen
7	Depth
8	Turbidity (NTU)
Water Column Parameters	
9	Bacteria (enterococci)
10	Nitrite Nitrogen
11	Nitrate+nitrite Nitrogen
12	Ammonia-nitrogen
13	Orthophosphorus
14	Chlorophyll a
15	Total Suspended Solids
Sediment Physical Characteristics	
16	Total Organic Carbon
17	Granulometry

War in the Pacific National Historical Park



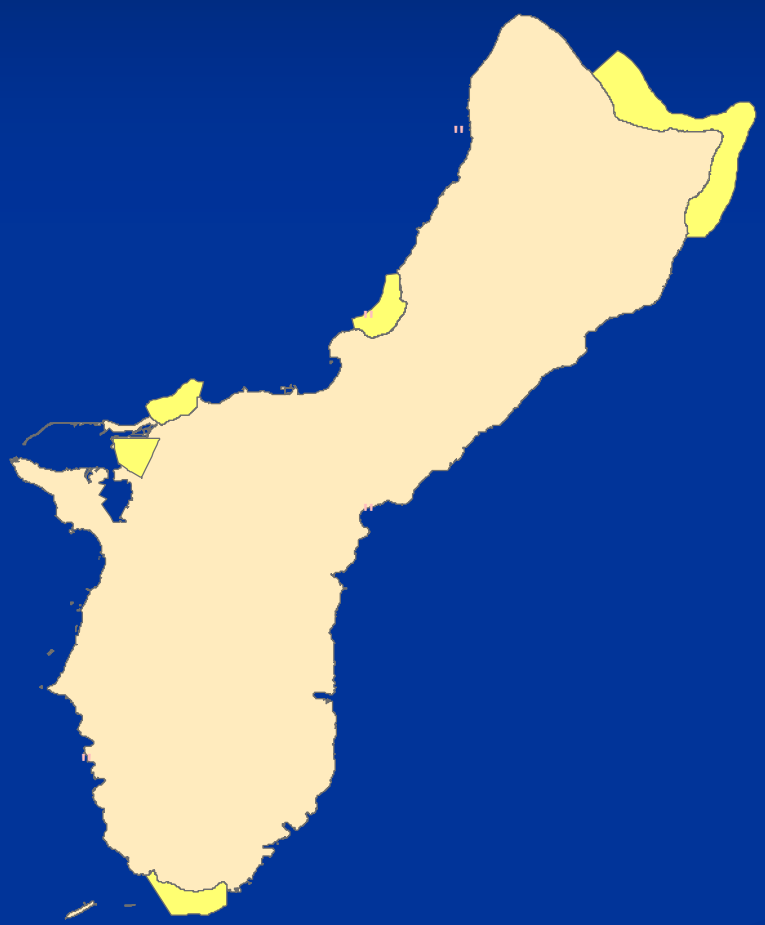
- Monitoring to assess the impact of wildland fires and badland mitigation techniques
- Chemical/Physical Parameters
  - Total Sediments
  - % Organic Content
  - % Carbonate Content
  - Sediment Size
  - Water Temperature
  - Light Penetration
- Biological Parameters
  - Benthic Cover
  - Coral Recruitment
  - Fish Abundance and Diversity

NOAA-MARAMP



- Fish, Turtle, & Marine Mammal Surveys
  - Belt Transects
  - Stationary Point Counts
  - Towed-diver surveys
  - Roving Diver Surveys
  - Hydroacoustic Surveys
- Benthic Surveys
  - Belt Transects
  - Towed Diver Surveys
  - Roving Diver Surveys
  - TOAD Towed Camera Surveys
- Oceanography
  - Closely-spaced CTDs
  - Drifters
  - Subsurface Temperature
  - ADCP Transects
  - CREWS/SST Buoys
  - Current/Wave Moorings

University of Guam Marine Laboratory



- Long-term Monitoring
  - Coral Cover
  - Coral Recruitment
  - Water Quality
- Coral Disease
- Molecular Biomarkers
- Soft-Coral Bioindicators
- Fouha Bay
  - Monitoring sediment input and coral cover


Thank You!